At the End of the Pipe: Issues & Impacts Associated With Manchester's Urban Ponds

NEC NALMS Annual Meeting

Saturday June 4, 2005

Jen Drociak

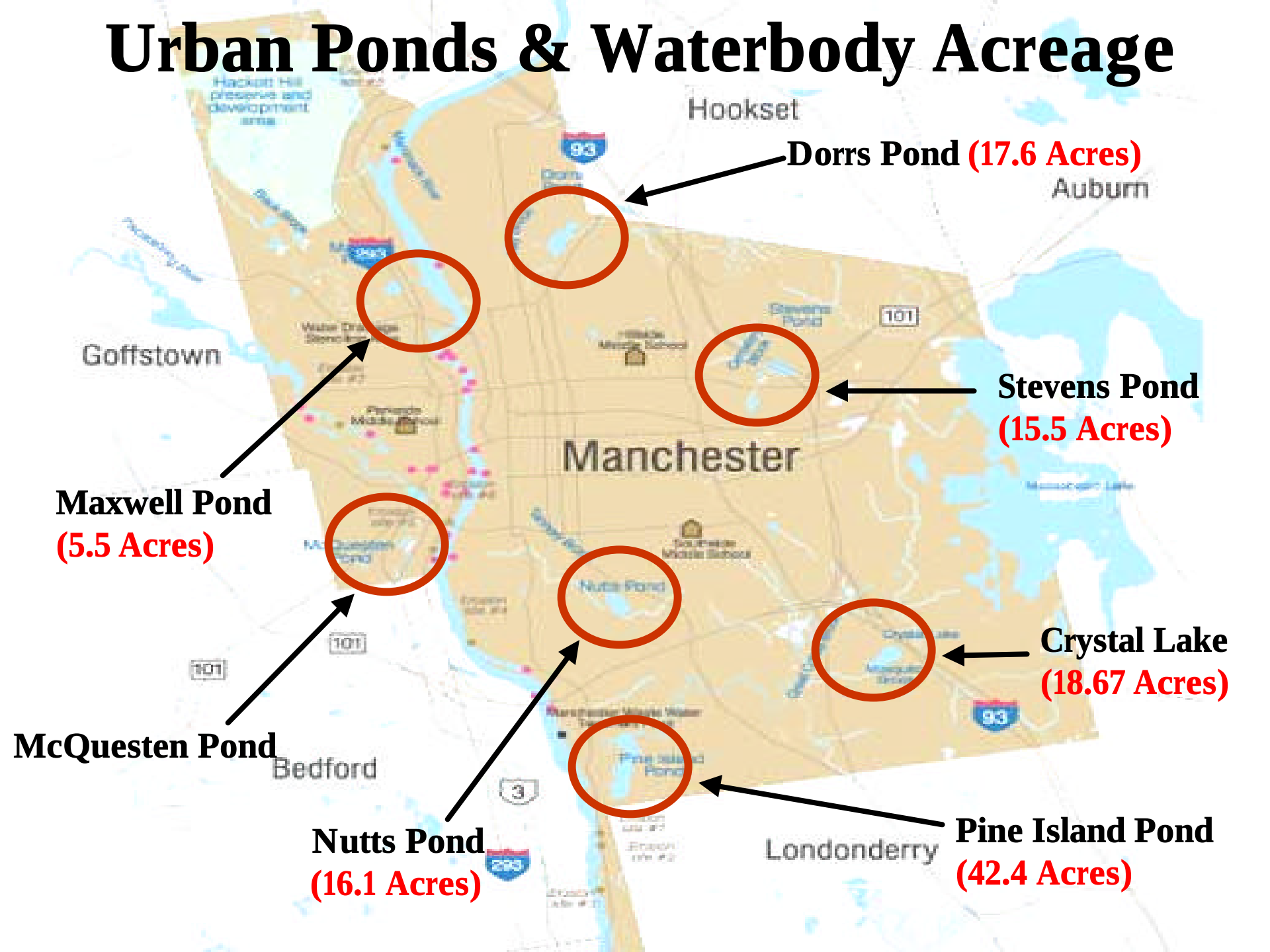
Manchester Conservation Commission

Urban Ponds Restoration Program

Overview

1. Common Issues Facing Manchester's Ponds
2. Manchester Urban Pond Restoration Program
3. Data Collection, Goal Setting & Project Prioritization / Planning
4. Case Studies: Solutions & Project Implementation
5. Outreach / Education Endeavors

Urban Ponds & Waterbody Acreage



Urban Ponds & Watershed Acreage

Crystal Lake
(200 Acres)

Dorrs Pond
Impoundment of Ray Brook
(1,472 Acres)

Maxwell Pond
Impoundment of Black Brook
(1,502 Acres)

McQuesten Pond

Nutts Pond
(415 Acres)

Pine Island Pond
Impoundment of Cohas Brook
(7,239 Acres)

Stevens Pond
(444 Acres)

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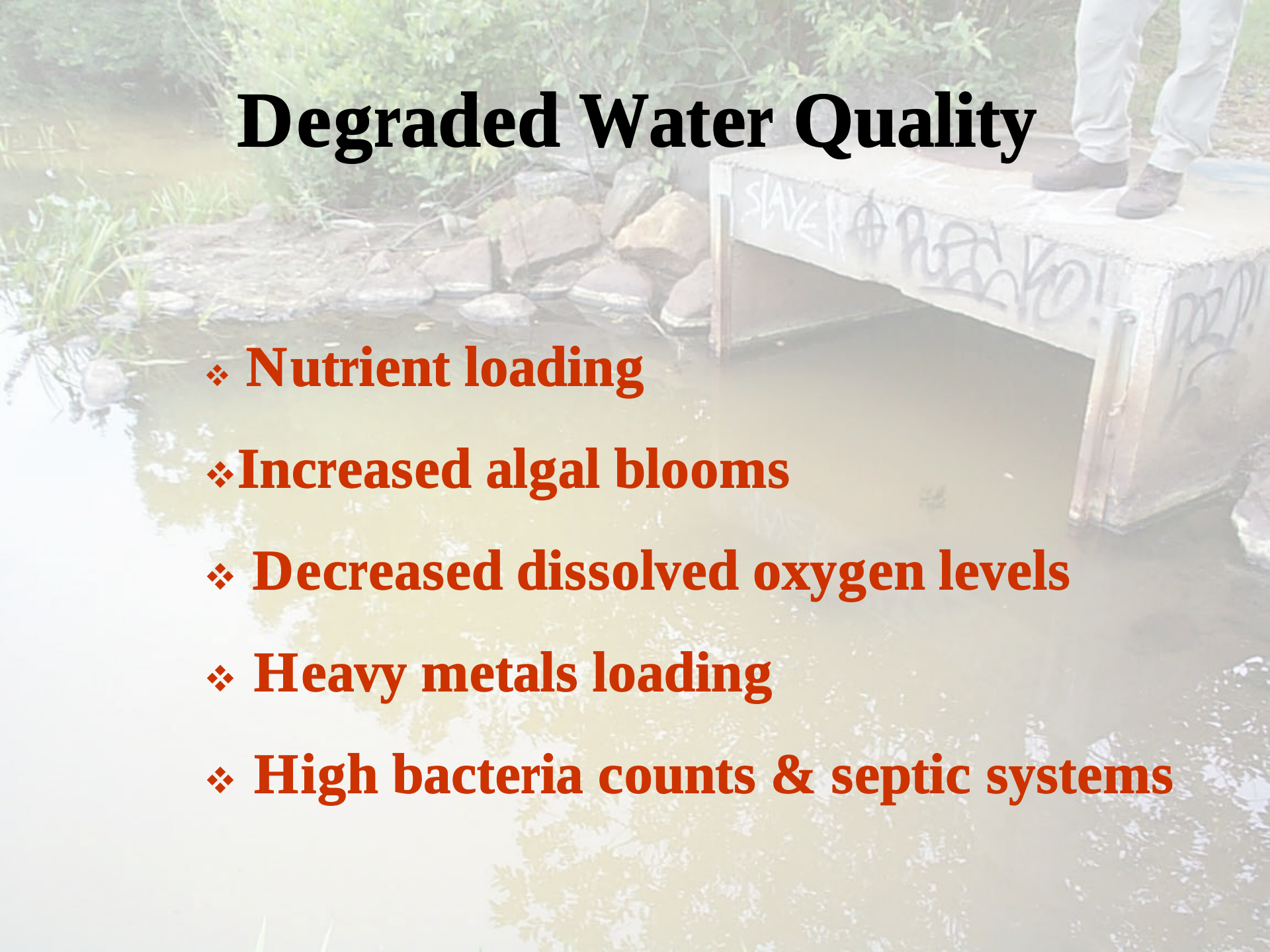
Degraded Water Quality



- Nutrient loading
- Increased algal blooms
- Decreased dissolved oxygen levels
- Heavy metals loading
- High bacteria counts & septic systems

Stormwater & Sediment Runoff from Culverts & Tributaries

(NPS Pollution)

- Rain, snow runs over land, picks up pollutants, deposits them into waterbodies.
- Includes oil and sand from roadways, sediments from construction sites, eroding streambanks, nutrients, toxic materials from urban and suburban areas.

* High-intensity flash storm surges *

- Ray Brook → Dorrs Pond
- Tannery Brook → Nutts Pond
- Cemetery Brook → Stevens Pond

Eroded Shorelines & Inadequate Vegetative Buffers

- Intensely-maintained shorelines.
- Inadequate vegetation on shorelines.
- Armored banks.

Erosion causes increased sediment, phosphorus loading, smothers bottom habitat, and decreases water clarity

Commercial Zones:
Second Street & So. Willow Street

Transient Residents

- **Difficult generating public support and participation at Maxwell Pond and Nutts Pond since most of the abutters are apartment-dwellers and do not live in the area long-term.**

Crystal Lake, Dorrs Pond, & Pine Island Pond surrounded by home and camp owners. Crystal Lake and Dorrs Pond both have active and successful pond preservation societies

I93 Highway Runoff

- **Stevens Pond:** Receives untreated runoff from I93.
- Some of the highest **chloride** and **sodium** levels for a freshwater body in the state of NH!

Don’t forget the **sand, oil, grit** and other vehicular “drippings” that find themselves in the water!

Dumpsters, Trash, Illegal Dumping

Graffiti


STOP
REMOVE ALL PLANT FRAGMENTS FROM BOATS, ANCHORS, MOTORS, TRAILERS, DIVING GEAR AND FISHING EQUIPMENT BEFORE LEAVING THIS ACCESS SITE
DISPOSE OF PLANT FRAGMENTS AWAY FROM SURFACE WATERS
WARNING!
Nutts Pond contains an exotic aquatic plant

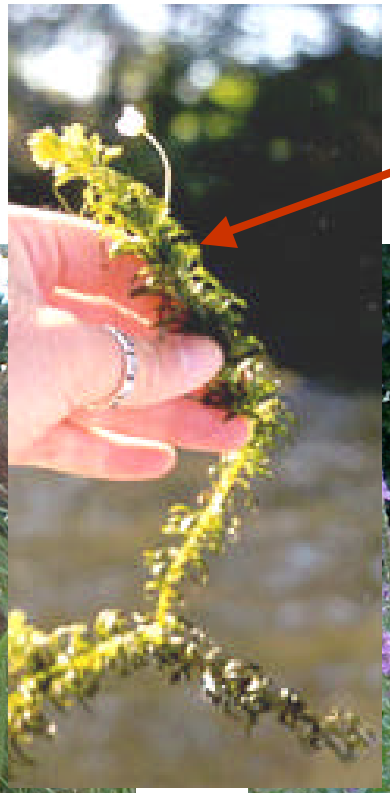
Invasive Plant Species: Terrestrial

Autumn Olive

Japanese Knotweed

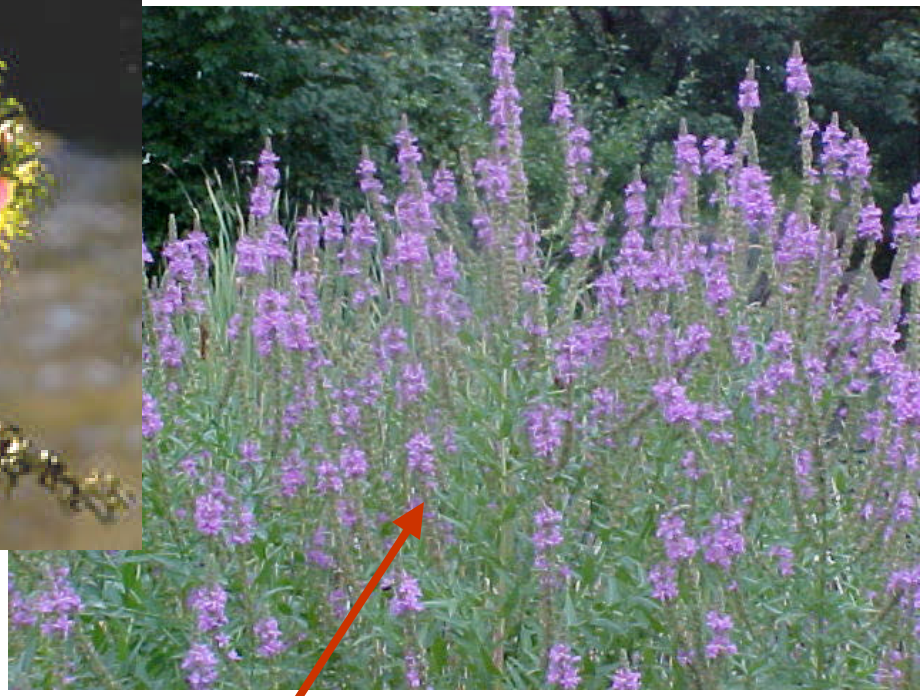
European Buckthorn

Aquatic Invasive Species



Brazilian elodea

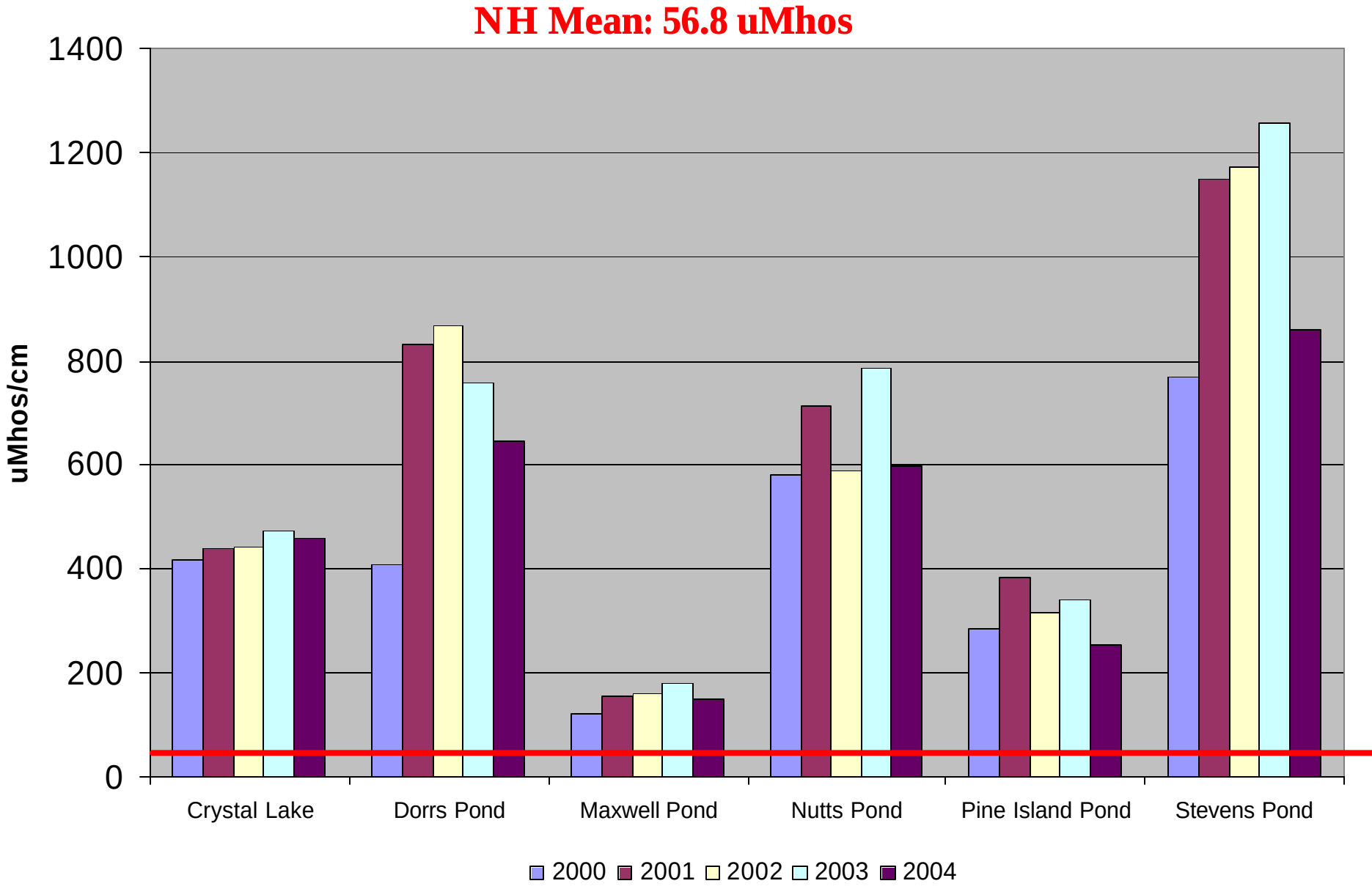
Common Reed
(Phragmites)



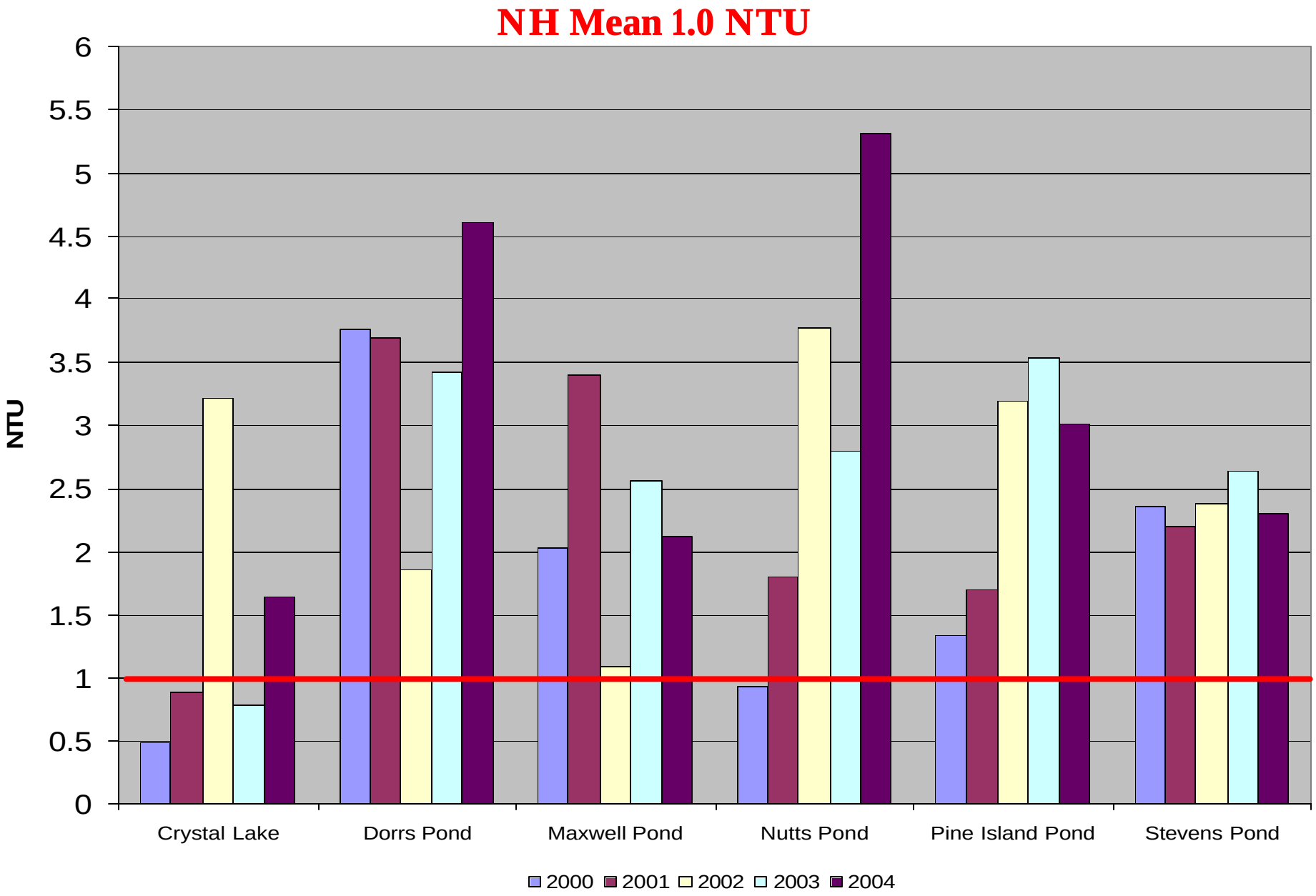
Purple Loosestrife

Purple Loosestrife – An Ambitious Invader!

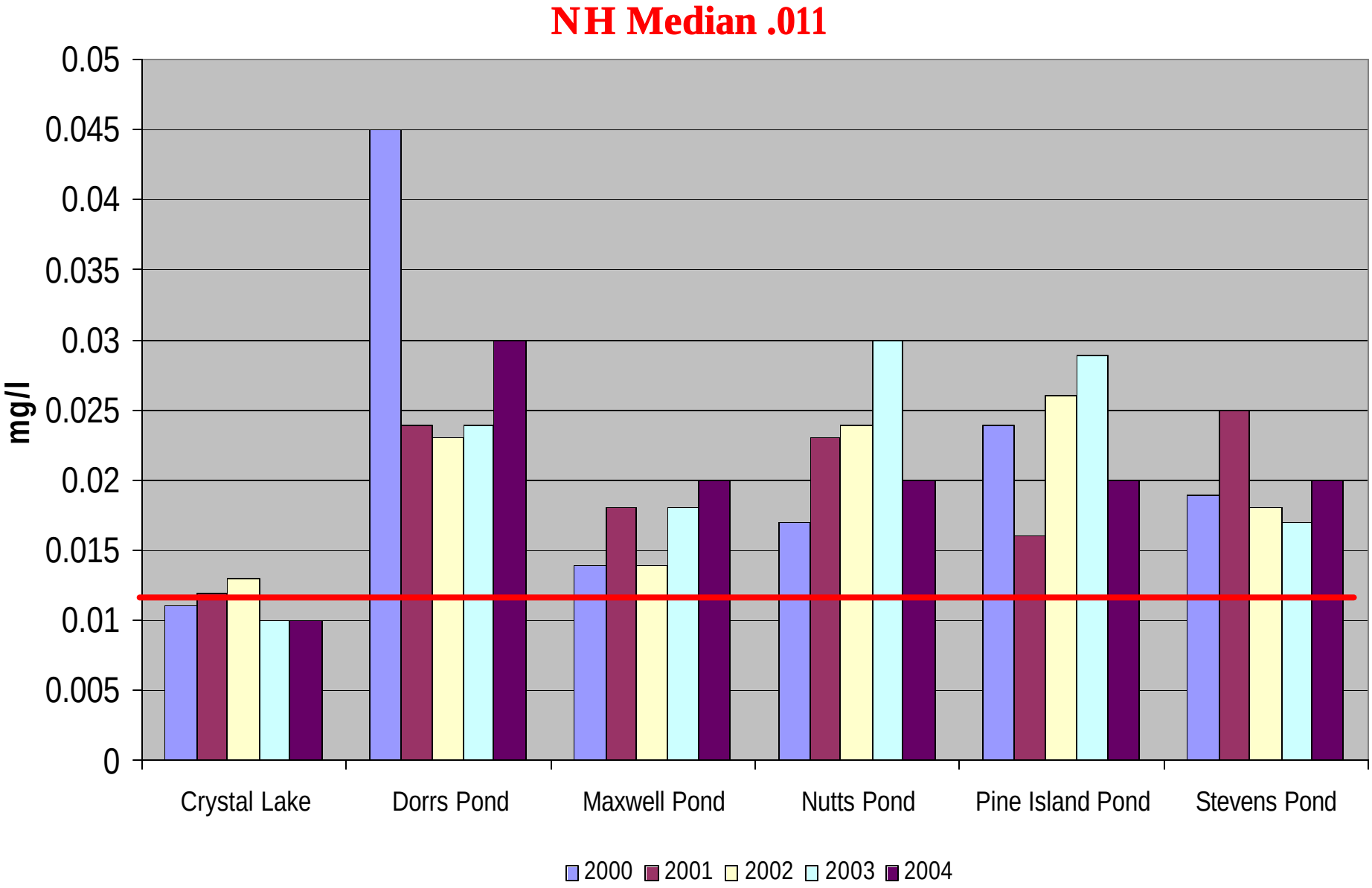
Conductivity (2000-2004)



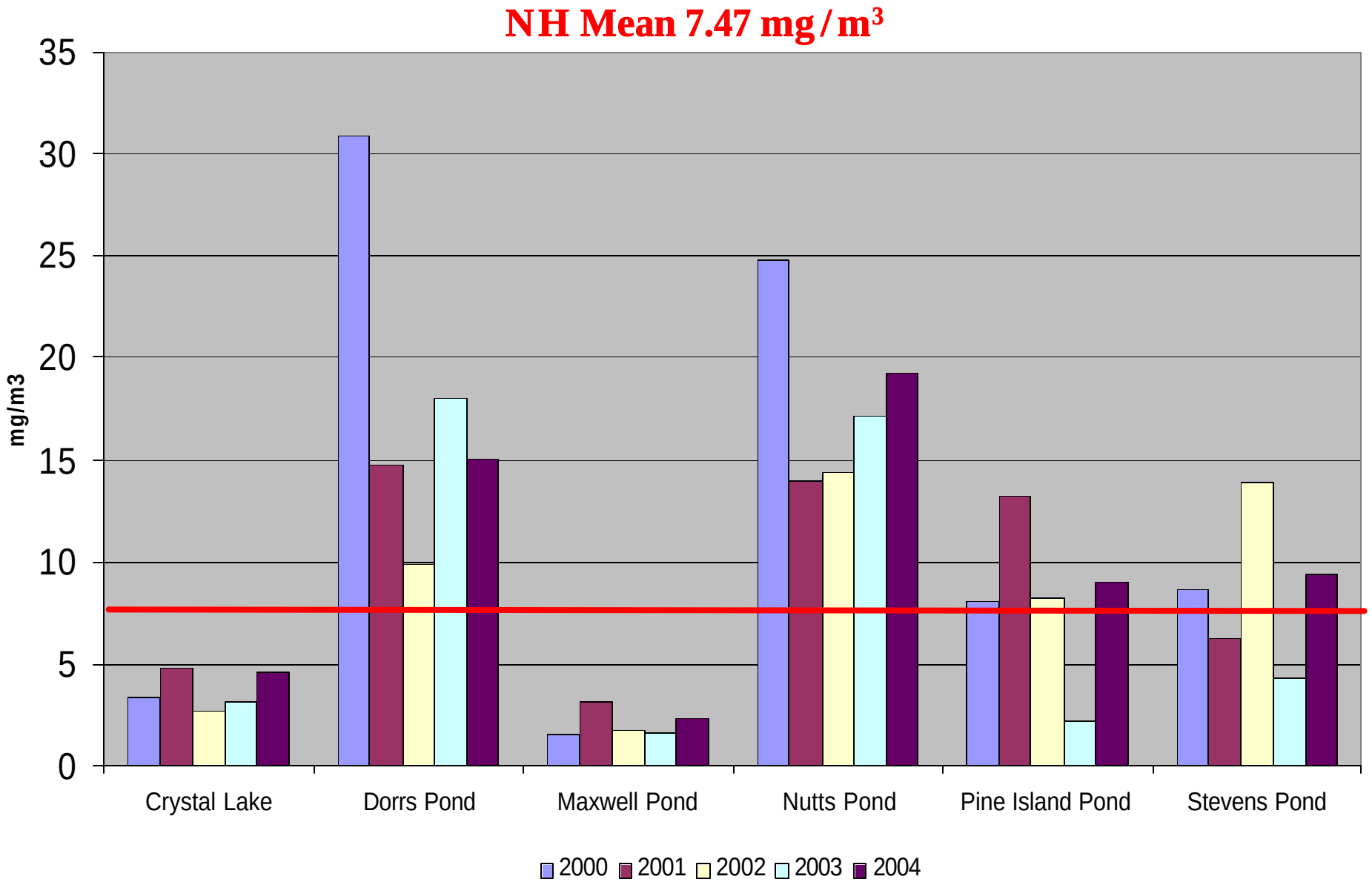
Turbidity (2000-2004)



Total Phosphorus (Epilimnion) 2000-2004



Chlorophyll-a (2000-2004)



2. Manchester Urban Pond Restoration Program

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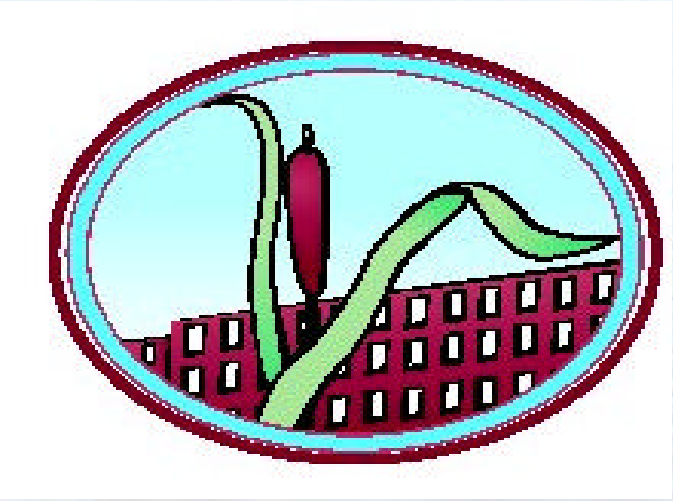

“Improving the health of Manchester’s ponds with the power of partnership and the spirit of community”

What Is The Manchester Urban Ponds Restoration Program?

- Part of the Supplemental Environmental Projects Plan (SEPP)
- Agreement between the city of Manchester, NHDES & USEPA correct the combined sewer/stormwater overflow problem.
- One of several environmental projects.
- 7 ponds in Manchester have been evaluated and monitored for restoration potential.

What is the Goal of the Program?

Goal: **Return the ponds to their historical uses**

Objectives:

1. Promote public awareness, education, and stewardship.

2. Reduce pollutant load/nutrient inputs to improve water quality.

3. Maintain or enhance biological diversity.

4. Provide better recreational uses.

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How Do We Proceed?!

- 7 Ponds
- 4 Inlets, 7 Outlets
- Other unnamed / seasonal tributaries / stormwater runoff
- 1 Staff Person (Planning Department)
- 5 Years (2000-2005)
- $ 1 Million

1st Year (2000) Point & Nonpoint Source Shoreline Surveys

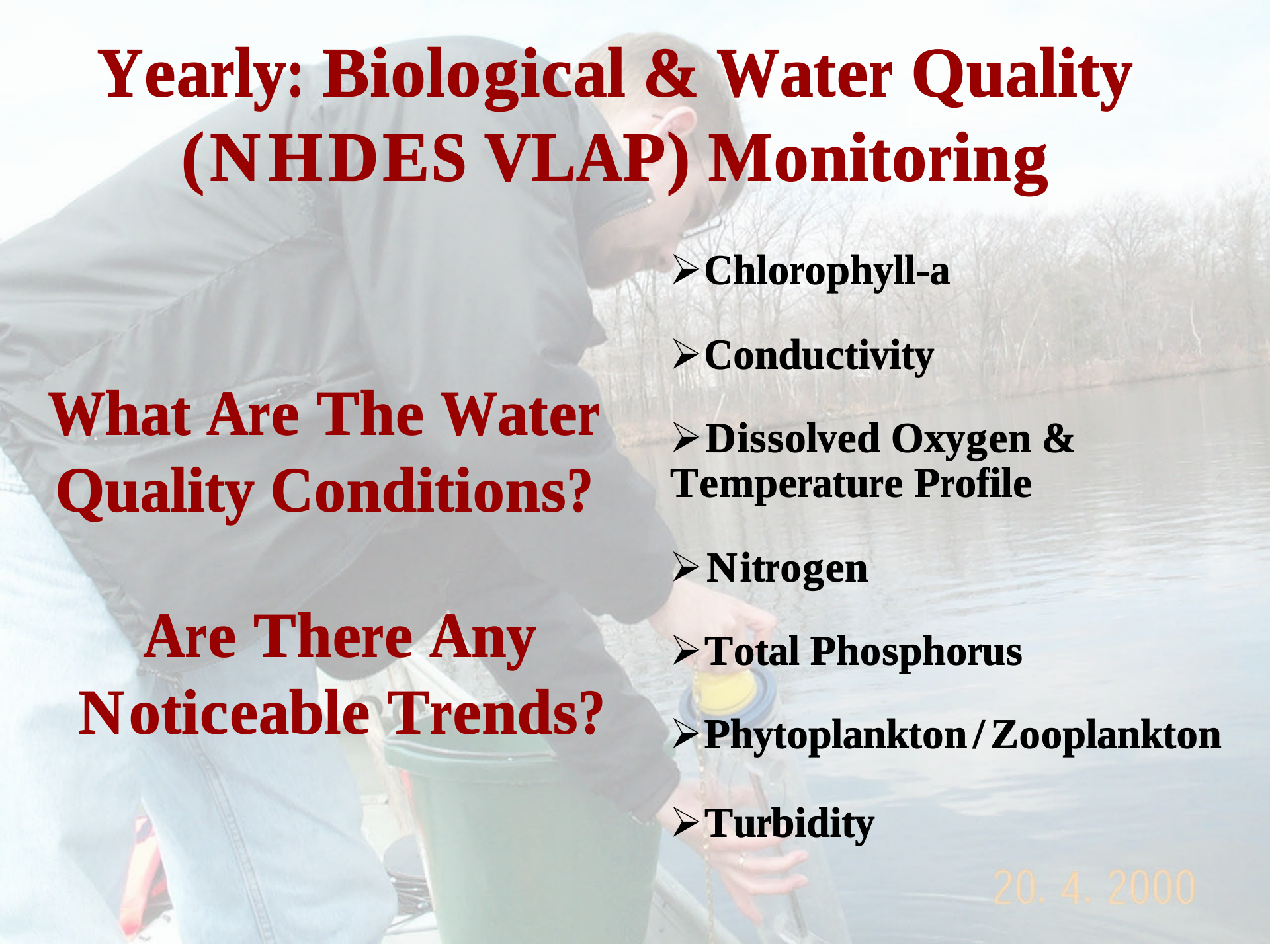
- Delineated and walked boundaries of watershed, inlets, and tributaries.
- Mapped point & NPS “hotspots”

Yearly: Biological & Water Quality (NHDES VLAP) Monitoring

What Are The Water Quality Conditions?

Are There Any Noticeable Trends?

- **Chlorophyll-a**
- **Conductivity**
- **Dissolved Oxygen & Temperature Profile**
- **Nitrogen**
- **Total Phosphorus**
- **Phytoplankton / Zooplankton**
- **Turbidity**



2nd Year (2001) Shoreline & In-Lake Vegetation Surveys

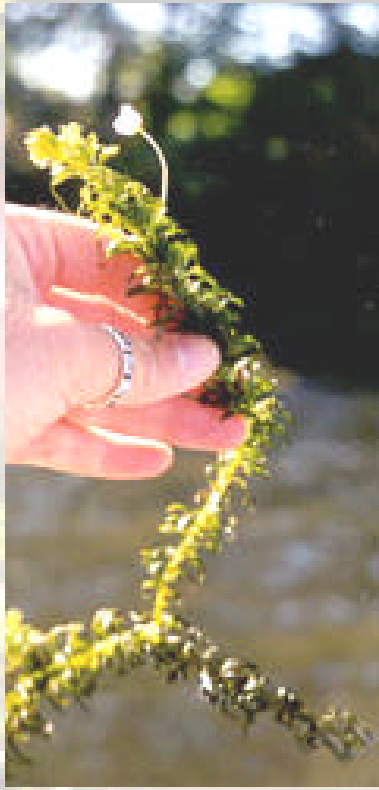
What Vegetative Communities Are Present?

Are There Any Invasive Species?

Found: Brazilian Elodea! (2001)

The Bad News:

- Non-native, exotic aquatic plant!
- Not documented in NH prior to this finding!
- First documentation in New England!
- Potential to be worse than variable milfoil!



The Good News:

- Pond not heavily used by motor-boaters
- Herbicide application: 2002
- Benthic-barriers: 2003
- Gone / 2 small strands: 2004!

3rd Year (2002)
Fish Surveys & Tissue Analysis

Are The Fish Safe To Eat?
(Mercury Content & Toxics)

3rd Year (2002)
Sediment Sampling & Analysis

All Ponds: Nutrient Input Study

Next Steps

1. **Identify Stakeholders & Interested Parties**
2. **Identify Perceptions & Concerns of Stakeholders**
3. **Attempt to Identify Sources of Problems Instead of Symptoms**
4. **Identify Possible Solutions & Project Partners**
5. **Identify Time Frames, Cost Approximations, & Possible Funding Opportunities (Low-Hanging Fruit versus Long-Term Projects)**

Then:
Develop A Well-Defined Plan!

- **1 UPRP Staff, 7 Conservation Commissioners, 3 (very long!) meetings.**
- **Defined Broad Goal(s) for each pond.**
- **Listed objectives and possible projects to meet that goal including:**
  1. **Water Quality Improvement Projects**
  2. **Outreach / Education Endeavors**
  3. **Recreational Opportunities**
  4. **Land Preservation Opportunities**

The Result: A document that prioritizes projects according to category, feasibility, and cost analysis

Measurements
5 Years Later (2005)

- **UPRP Coordinator Position: Permanent Fixture in Planning Department.**
- **Crystal Lake: 6/10 identified projects implemented***
- **Dorrs Pond: 8/15 identified projects implemented***
- **Maxwell Pond: 4/8 identified projects implemented***
- **McQuesten Pond: 3/8 identified projects implemented***
- **Nutts Pond: 8/9 identified projects implemented***
- **Pine Island Pond: 3/8 identified projects implemented***
- **Stevens Pond: 3/8 identified projects implemented***

The Fine Print*

Restoration/Project Implementation Obstacles:

- **Limited Time (5 Years)**

  - Several Project Partners: ***(Conservation Commission, Environmental Protection Division, Highway Department, Parks & Recreation, Planning Department)***

  - Engineering Design Phase

  - Permitting Phase

  - Contracting Phase

  - Remaining projects large, difficult, expensive

  - Some are in one of several phases, will be started or completed within year or two.

- **Limited Budget ($1 Million): More $ Needed from City, Grants**
- **Low-Hanging Fruit (Small projects, outreach/education, etc)**

4. Case Studies: Solutions & Project Implementation

5. Outreach / Education Endeavors

Crystal Lake: “Stormtreat”

6 sedimentation chambers & constructed wetland in a tank.

1. Stormwater → chambers. Larger solids removed.

2. Inside skimmers empty the upper portions of basins. More turbid waters left below.

3. Partially treated stormwater → into surrounding constructed wetland through a series of slotted pipes.

4. Wetland is of gravel substrate planted with bulrushes, etc.

5. Stormwater → subsurface of wetland & through root zone.

Pollution is filtered, adsorbed, and bio-chemically reacts

Crystal Lake & Pine Island Pond: City Sewer Interceptor / Tie In

- Crystal Lake – 2001
- Pine Island Pond – Fall 2003
- All homes / camps
- Decrease in bacteria levels & nutrient inputs.

Crystal Lake: Parking Lot Reconstruction & Drainage Improvement

Purpose: Improve the water quality through the installation of BMPs at two stormwater inlets. Combination of bank stabilization, grassed swales, infiltration areas, and velocity-reducing structures will capture nutrients and bacteria, before entering the lake.

Grant Amount: $73,483.00
Local Match Amount: $50,668.00
Total Project Cost: $124,151.00

Crystal Lake:
Parking Lot Improvements

Drainage Trench

Updated Parking Area

Crystal Lake:
Parking Lot Improvements

Leaching Catch Basin

Drainage Swale

Crystal Lake: Vandalism

ATV/Bike Damage

Guard Rail

Crystal Lake:
Corning Road Drainage Improvements

Installation of Granite Curbing

Bank Stabilization

Baffle Tank:

Area Paved, Loamed, Seeded

Crystal Lake: *Phragmites* Control

Area to be Dredged:

End of Parking Lot Drainage

Dredging

Crystal Lake: *Phragmites* Control

Dewatering Area

Dredged Area

Crystal Lake: *Phragmites* Control

Dorrs Pond: “Downstream Defender”

Separates solids from liquids by using fluid hydraulics

1. **Placement of inlet / outlet pipes direct flow in a pre-determined path**
2. **Stormwater introduced into the side, spirals around the perimeter, & oil and floatables rise to the water surface and are trapped**
3. **Flow continues to rotate & travels down toward the bottom**
4. **Sediment directed toward the center / bottom of the vessel and is collected**
5. **Center protects sediment & redirects the main flow upwards / inwards.**

By the time the flow reaches the top of the vessel, it is virtually free of solids and is discharged through the outlet pipe.

Dorrs Pond: Tributary Work

Purpose: **Address nutrient loading and sedimentation in Dorrs Pond. Inlet II East collects large amounts of untreated runoff and is leading to the eutrophication of the pond. Installation of primary and secondary treatment to greatly reduce the pollutant load reaching the pond. Treatment measures include a water quality inlet device and meandering grass swale.**

Grant Amount: $48,321.00
Local Match Amount: $32,213.40
Total Project Cost: $80,534.40

Dorrs Pond: Tributary 1

Existing Headwall

Baffle Tank

Completed Site

Dorrs Pond: Tributary 1

Erosion Control

Soil Over Headwall

Soil Over Headwall

Dorrs Pond: Tributary 1

Curbing Installed

Dorrs Pond: Tributary 2

Trees Removed

Baffle Tank Installed

Dorrs Pond: Tributary 2

Granite & Arborvitaes

Vegetated Site

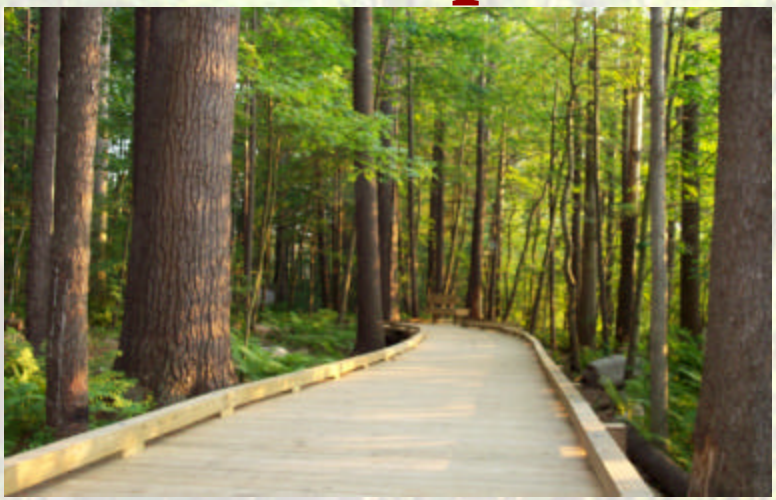
Dorrs Pond: Tributary 3

Brook Channeling

Bio Logs

Dorrs Pond: Shoreline Stabilization

Dorrs Pond: Rehabilitation of Walkways/Loop Trail, Parking Lot & Boat-Ramp



Maxwell Pond/Black Brook: Dam Removal Feasibility Study & Corridor Restoration

Nutts Pond: Rails-To-Trails

- In partnership with Queen City Trail Alliance
- Will connect South Willow Street with Downtown/Millyard
- Runs adjacent to the west side of Nutts Pond

Nutts Pond: Pollution Prevention On-Site Assessment Business Survey

- Storage tanks
- Solid waste / dumpster maintenance
- Floor drains
- Stormwater management
- Hazardous waste storage
- Cleaning products
- Used oil
- Parts washing / absorbents
- Lead-acid batteries
- Antifreeze
- Vehicle washing, etc.

Businesses visited & surveys completed during the Summer of 2003

Businesses which were visited received BMP materials in appropriate areas

Follow up visits may be held to gain specific measurements

Stevens Pond: Chloride Reduction Feasibility Study

Chloride & sodium levels are among the highest ever recorded in a freshwater body in New Hampshire!

Task 1. Delineate Drainage Areas –using topo & storm drain maps

Task 2. Calculate Land Areas Receiving Salt Applications -1) roadway maintained by DOT 2) roadway maintained by the City of Manchester 3) private roadways 4) residential properties 5) commercial properties.

Task 3. Calculate Annual Salt Loadings to the Pond for Each Category and Each Subwatershed

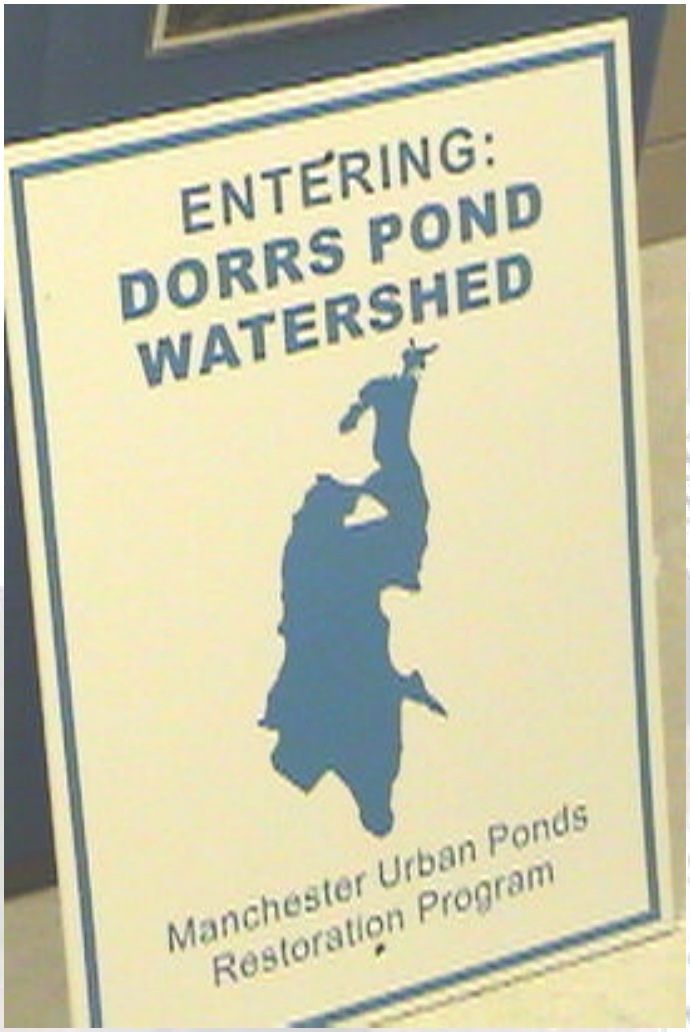
Task 5. Prepare a Letter Report –Summarizing findings & making recommendations.

5. Outreach / Education Endeavors

Community Involvement

- Bi-Annual Pond Clean-Ups
- Water Quality Monitoring Assistance
- Local Pond Preservation Societies
- Storm Drain Stenciling Events
- Shoreline Surveys

Watershed Signs



Presentations & Events

- **Classroom Presentations (Middle School, High School, Community Colleges)**
- **Other Presentations: NHDES, NHLA**

Meet Your Pond!

Do you see Manchester's urban ponds as life-less or "dead"? The truth is, they are abundant with life!

Join the Urban Ponds Restoration Coordinator and members of the conservation commission for a "Meet Your Pond" adventure!

We will walk the trails, identify native and exotic vegetation (including a carnivorous plant!), collect and identify common stream insects, look for frogs, fish, birds, and even examine tiny, microscopic plants (phytoplankton) and animals (zooplankton). We will also discuss current issues surrounding the pond, and what we can do to improve the water quality.

In addition, you can see how to sample a pond for chemical and biological parameters. Boat rides may be available. If you have them, bring your boots, binoculars, and dress accordingly!

Join Us!
All pond activities are from 9:00-12:00noon.

Saturday July 13: Doors Pond
Thursday July 18: Nutts Pond
Saturday August 3: Maxwell Pond
Saturday August 10: Stevens Pond
Thursday August 15: McQuesten Pond

SECOND ANNUAL MANCHESTER EARTH AND PONDS FESTIVAL

Date: Saturday 6/22/02 Time: 10 AM - 3 PM
Livingston Park, D.W. Highway, Manchester

Join us for an outdoor family festival designed to raise awareness of Manchester's environment!

Highlights Include:

- Environmental exhibitors
- Kids activities
  - face painting
  - games, clowns
- Raffle prizes
- Kayak demonstrations
- Interpretive trail walks
- Live entertainment

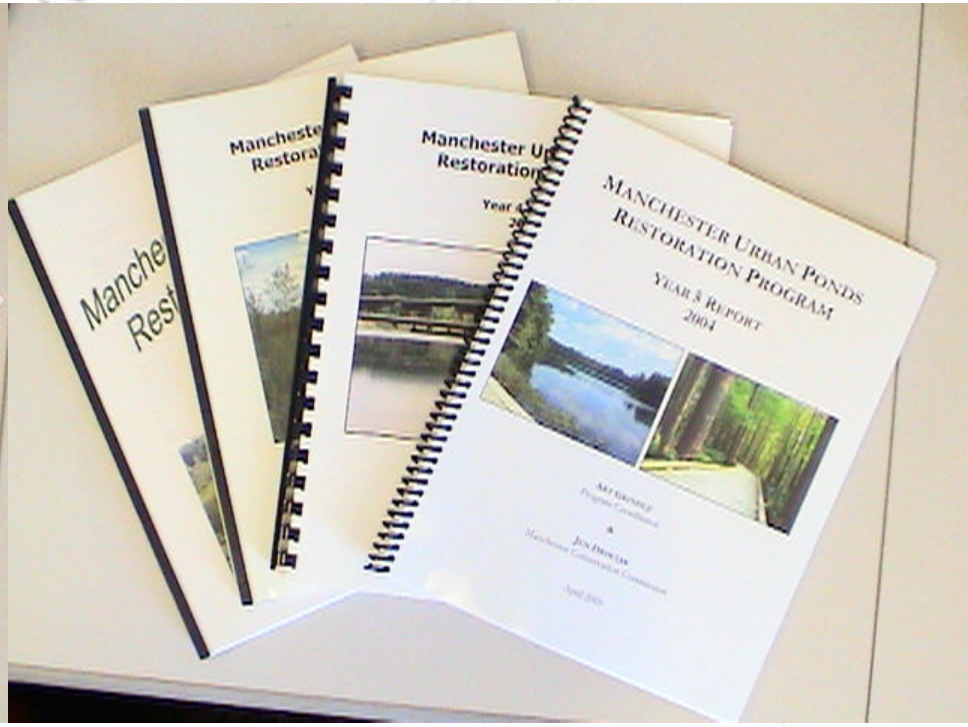
This Event Is Sponsored By:
Manchester Urban Ponds Restoration Program
Manchester Recycling Committee
Manchester Conservation Commission

Traveling Display

City Hall, Workshops, Conferences, Festivals, Libraries, Schools

Newsletters & Annual Report

600 Copies of "Pond Possibilities"
Produced and Distributed Bi-Annually



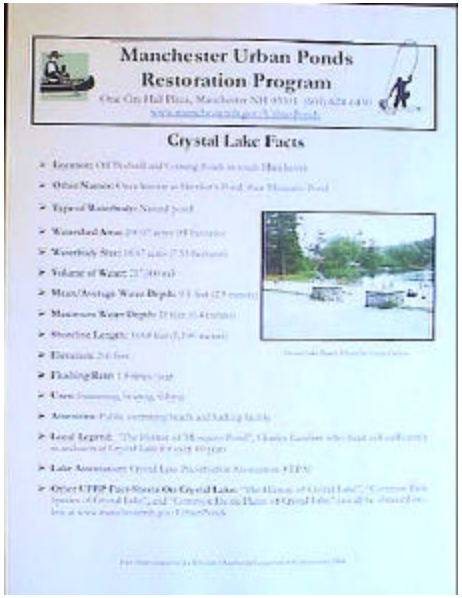
60 Copies of Report
Produced and Distributed Annually

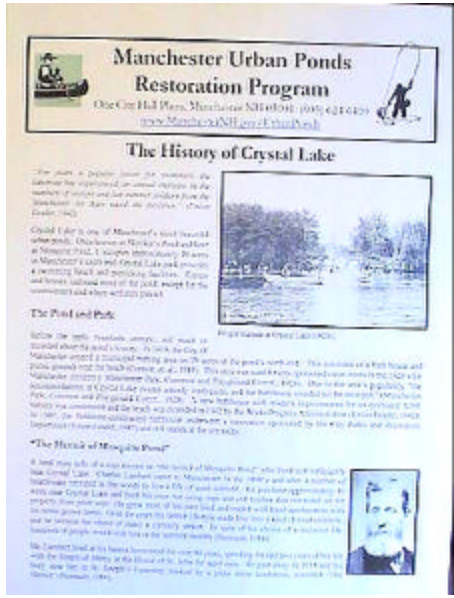
Creation & Retrofit of Kiosks

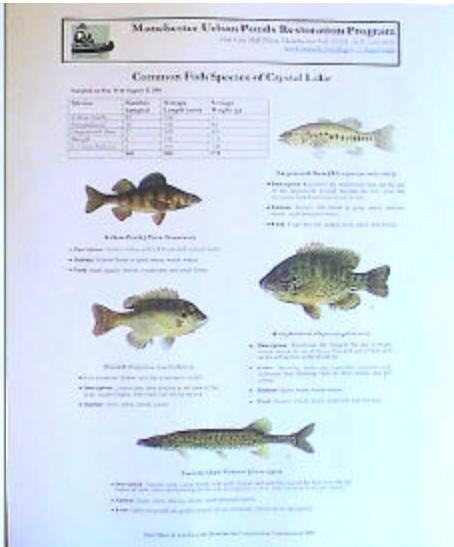
- **Constructed 3 Kiosks (Maxwell Pond, McQuesten Pond, Stevens Pond)**
- **Retrofitted 3 Kiosks (Crystal Lake, Nutts Pond, Pine Island Pond)**

Fact-Sheets (For Kiosks & Events)

- Map of waterbody / watershed.
- Pond Facts.
- Water Quality Data.
- History of Waterbody.
- Common Exotic Plants.
- Common Fish.
- Nonpoint Source Pollution Issues.

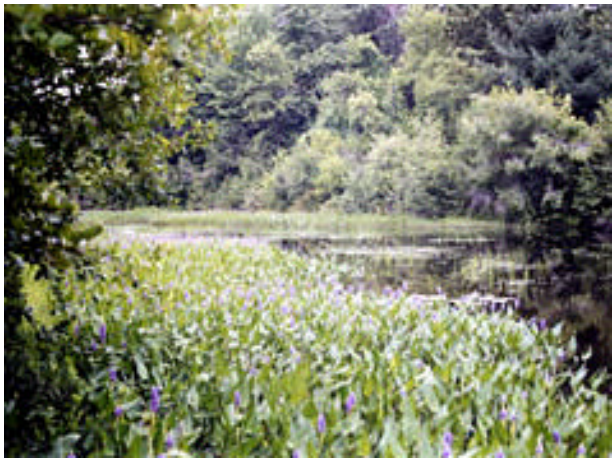






Web Site!

www.manchesternh.gov/UrbanPonds



Thank You!

Jen Drociak –

Manchester Conservation Commission

Urban Ponds Restoration Program

1 City Hall Plaza

Manchester, NH 03103

(603) 624-6450

urbanponds@yahoo.com

http://www.manchesternh.gov/UrbanPonds